Science Standards of Learning

Teacher Resource Guide

Grade Four

Commonwealth of Virginia
Department of Education
Richmond, Virginia
2000

Grade Four
Science Strand

Scientific Investigation, Reasoning, and Logic

This strand represents a set of inquiry skills that defines what a student should be able to do when conducting activities and investigations. The various skill categories are described in the "Investigate and Understand" section of the *Standards of Learning*, and the skills in science standard 4.1 represent more specifically what a student should be able to do as a result of science experiences in fourth grade. Across the grade levels the skills in the "Scientific Investigation, Reasoning, and Logic" strand form a near continuous sequence of investigative skills. (Please note Appendix, "Science Skills, Scope, & Sequence.") It is important that the classroom teacher understands how the skills in standard 4.1 are a key part of this sequence (i. e., K.1, K.2, 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, and 6.2). The fourth grade curriculum should ensure that skills from preceding grades are continuously reinforced and developed. It is also important to note that 25% of items on the 3rd and 5th grade SOL assessments measure the skills defined in this strand.

Strand: Scientific Investigation, Reasoning, and Logic

Standard 4.1

The student will plan and conduct investigations in which

- distinctions are made among observations, conclusions (inferences), and predictions;
- data are classified to create frequency distributions;
- appropriate metric measures are used to collect, record, and report data;
- appropriate instruments are selected to measure linear distance, volume, mass, and temperature;
- predictions are made based on data from picture graphs, bar graphs, and basic line graphs;
- hypotheses are formulated based on cause and effect relationships;
- variables that must be held constant in an experimental situation are defined; and
- numerical data that are contradictory or unusual in experimental results are recognized.

Understanding the Standard

The skills described in standard 4.1 are intended to define the "investigate" component of all of the other fourth grade standards (4.2 – 4.8). The intent of standard 4.1 is that students will continue to develop a range of inquiry skills and achieve proficiency with those skills in the context of the concepts developed at the fourth grade. Standard 4.1 does not require a discrete unit on scientific investigation because the inquiry skills that make up the standard should be incorporated in all the other fourth grade standards. It is also intended that by developing these skills, students will achieve greater understanding of scientific inquiry and the nature of science, as well as more fully grasp the content-related concepts.

Standard 4.1

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: · To communicate an observation accurately, one must provide a clear description of exactly what is observed, and nothing more. Those conducting investigations need to understand the difference between *what is seen* and what inferences, conclusions, or interpretations can be drawn from the observation. · An inference is a conclusion based on evidence about events that *have already occurred*. Accurate observations and evidence are necessary to draw realistic and plausible conclusions. · A scientific prediction is a forecast about what *may happen* in some future situation. It is based on the application of scientific principles and factual information. · Systematic investigations require standard measures (metric), consistent and reliable tools, and organized reporting of data. The way the data are displayed can make it easier to uncover important information. This can assist in making reliable scientific forecasts of future events.	In order to meet this standard, it is expected that students should be able to: · differentiate among simple observations, conclusions, and predictions, and correctly apply the terminology in oral and written work. This requires students to comprehend the basic terminology and apply it in novel situations related to 4th grade SOL concepts. · analyze a set of twenty-five or fewer objects, measures, or pictures; classify into basic categories to organize the data (descriptive or numerical); and construct bar graphs depicting the distribution of those data. · use millimeters, centimeters, meters, kilometers, milliliters, liters, grams, and kilograms in measurement. · choose the appropriate instruments including centimeter rulers, meter sticks, graduated cylinders, beakers, scales and balances, and Celsius thermometers for making basic metric measures. · make predictions based on picture graphs, bar graphs and basic line graphs.

Standard 4.1 (continued)

Overview	Essential Knowledge, Skills, and Processes
· An experiment is a fair test driven by a hypothesis. A fair test is one in which only one variable is compared. A hypothesis is a prediction about the relationship between variables. · In order to conduct an experiment, one must recognize all of the potential variables or changes that can affect its outcome.	· create a plausible hypothesis from a set of basic observations, stated in terms of cause and effect that can be tested. This requires a student to comprehend what "cause and effect" is, and be able to apply that idea in new situations. The application should occur in terms of 4th grade SOL-related concepts or other concrete situations. Hypotheses should be stated in terms such as, "if the water temperature is increased, then amount of sugar that can be dissolved in it will increase." · analyze the variables in a simple experiment, and decide which must be held constant (not allowed to change) in order for the investigation to represent a fair test. This requires students to comprehend what "variables" are, and apply that idea in new situations related to 4th grade SOL concepts. · judge which, if any, data in a simple set of results (generally ten or fewer numbers) appear to be considerably outside the expected range. Students should be able to determine the significance of unusual data.

Grade Four
Science Strand

Force, Motion, and Energy

The strand “Force, Motion and Energy" focuses on students understanding of what force, motion, and energy are and how the concepts are connected. The major topics developed in this strand include magnetism; types of motion; simple machines; and energy forms and transformations, especially electricity, sound, and light. This strand includes science standards K.3, 1.2, 2.2, 3.2, 4.2, 4.3, 5.2, 5.3, 6.3, and 6.4.

Strand: Force, Motion, and Energy

Standard 4.2

The student will investigate and understand that energy is needed to do work and that machines make work easier. Key concepts include

- energy forms (electrical, mechanical, and chemical energy);
- potential and kinetic energy;
- simple and complex machines; and
- efficiency, friction, and inertia.

Understanding the Standard

This standard focuses on basic concepts of energy, work, and how machines make moving objects (doing work) easier. Energy is needed to do work, and work is done when a force causes an object to move. Students need to understand that the science concept of "work" is more than completing a task; however, calculating the actual work done and introducing more complex units and terminology is not necessary for 4th grade. This standard also focuses on forms of energy, how energy is stored and released, and introduces more abstract ideas related to machines, motion, and work. This standard builds on the simple machines introduced in third grade and prepares students for a more in-depth study of energy in sixth grade. It is intended that students will actively develop science investigation, reasoning, and logic skills (4.1) in the context of the key concepts presented in this standard.

Standard 4.2

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: · Energy is the ability to do work and work is the result of a force moving an object through a distance. · Energy may exist in two states: kinetic or potential. · There are many forms of energy. Electrical, mechanical, and chemical are common forms of energy. · Compound machines are any combination of two or more simple machines. Complex machines are made of many compound machines. · Machines make work easier by changing the direction of or increasing the effect of a force. Machines help us work more efficiently. · Efficiency is the relationship of energy expended to work accomplished. · Friction is the resistance to motion created by two objects moving against each other. Friction creates heat. · Unless acted on by a force, objects in motion tend to stay in motion and objects at rest remain at rest.	In order to meet this standard, it is expected that students should be able to: · explain and demonstrate work being done. · explain that energy is needed to do work. · differentiate between potential and kinetic energy. · determine whether energy is electrical, mechanical, or chemical. · describe the six simple machines, how each functions, and give examples of each found in common household items. · identify the simple machines in a compound machine. · analyze common household items and identify the simple machines in them. · design an investigation to model how machines make work easier. · design an investigation to determine the effect of friction on moving objects. · explain and demonstrate inertia.

Strand: Force, Motion, and Energy

Standard 4.3

The student will investigate and understand the characteristics of electricity. Key concepts include

- the nature of electricity (voltage, ampere, resistance, conductors, and insulators);
- circuits (open/closed, parallel/series);
- magnetism and magnetic fields;
- static electricity ; and
- historical contributions in understanding electricity.

Understanding the Standard

This standard focuses on the characteristics of electricity as related to circuits and circuit components, magnetism, static charges, and historical contributions important to its understanding. As electrical energy is an integral part of modern civilization - powering our computers; lighting, heating and cooling our homes and businesses; and making the information age possible, it is critical that students begin to understand basic electricity concepts. This standard will be the basis for a more in-depth study in the sixth grade (6.3 and 6.4). It is intended that students will actively develop science investigation, reasoning, and logic skills (4.1) in the context of the key concepts presented in this standard.

Standard 4.3

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: · A continuous flow of negative charges (electrons) creates an electric current. The pathway taken by an electric current is a circuit. Closed circuits allow the movement of electrical energy. Open circuits prevent the movement of electrical energy. · Volts and amperes (amps) are measures used to describe electricity. Common dry cells are generally low voltage (1.5 V). · Electrical energy moves through materials that are conductors. Insulators do not conduct electricity well. · Among conducting materials, energy passes more or less easily because of the material's resistance. · In a series circuit there is only one pathway for the current, but in a parallel circuit there are two or more pathways for it. · Certain iron-bearing metals attract other such metals (also nickel and cobalt).	In order to meet this standard, it is expected that students should be able to: · apply the terms insulators, conductors, open and closed in describing electrical circuits. · differentiate between an open and closed electric circuit. · describe volts and amps as measures of electricity. (Students do not need to understand detailed definitions of these terms.) · use the dry cell symbols (-) and (+). · create and diagram a functioning series circuit using dry cells, wires, switches, bulbs, and bulb holders. · create and diagram a functioning parallel circuit using dry cells, wires, switches, bulbs, and bulb holders. · differentiate between a parallel and series circuit. · create a diagram of a magnetic field using a magnet. · compare and contrast a permanent magnet and an electromagnet.

Standard 4.3 (continued)

Overview	Essential Knowledge, Skills, and Processes
· Lines of force extend from the poles of a magnet in an arched pattern defining the area over which magnetic force is exerted. · An electric current creates a magnetic field, and a moving magnetic field creates an electric current. · Rubbing certain materials together creates static electricity. · Lightning is the discharge of static electricity in the atmosphere. · Franklin, Faraday, and Edison made important discoveries about electricity.	· explain how electricity is generated by a moving magnetic field. · design an investigation using static electricity to attract or repel a variety of materials. · explain how static electricity is created and occurs in nature. · describe the contributions of Ben Franklin, Michael Faraday, and Thomas Edison to the understanding and harnessing of electricity.

Grade Four
Science Strand

Life Processes

The strand focuses on the life processes of plants and animals and the specific needs of each. The major topics developed in the strand include basic needs and life processes of organisms, their physical characteristics, orderly changes in life cycles, behavioral and physical adaptations, and survival and perpetuation of species. This strand includes science standards K.6, 1.4, 1.5, 2.4, 3.4, 4.4, and 6.8.

Strand: Life Processes

Standard 4.4

The student will investigate and understand basic plant anatomy and life processes. Key concepts include

- the structures of typical plants (leaves, stems, roots, and flowers);
- processes and structures involved with reproduction (pollination, stamen, pistil, sepal, embryo, spore, and seed);
- photosynthesis (chlorophyll, carbon dioxide); and
- dormancy.

Understanding the Standard

This standard focuses on the basic life processes and anatomy of plants. It represents a more in-depth treatment of the structures and processes associated with reproduction. Photosynthesis is introduced to in this standard. Closely related standards from previous grades include K.6, 1.4, and 2.4. This standard also is closely connected with concepts presented in science standard 4.5. It is intended that students will actively develop science investigation, reasoning, and logic skills (4.1) in the context of the key concepts presented in this standard.

Standard 4.4

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: · For many typical green plants there are anatomical structures that perform certain basic functions. For example, roots anchor the plants and take water and nutrients from the soil. Plant stems provide support and allow movement of water and nutrients. · The plant kingdom can be divided into two general groups, those that produce seeds and those that produce spores. · Many seed producing plants have roots, stems, leaves, and flowers. The stamen and pistil are reproductive parts of the flower. The sepals are the small leaves that form the housing of the developing flower. · Pollination is part of the reproductive process for flowering plants. Pollination is the process by which pollen is transferred from the stamens to the stigma. · Some plants reproduce with spores. These include ferns and mosses.	In order to meet this standard, it is expected that students should be able to: · create a model/diagram illustrating the parts of a flower and explain the functions of those parts. · analyze a common plant: identify the roots, stems, leaves, and flowers; and explain the function of each. · create a model/diagram illustrating the reproductive processes in typical flowering plants and explain the processes. · compare and contrast different ways plants are pollinated. · explain that ferns and mosses reproduce with spores rather than seeds. · explain the process of photosynthesis. · design an investigation to determine the relationship between the presence of sunlight and plant growth. · explain the role of dormancy for common plants.

Standard 4.4 (continued)

Overview	Essential Knowledge, Skills, and Processes
· Green plants produce their own food through the process of photosynthesis. Green plants use chlorophyll to produce food using carbon dioxide, water, nutrients, and sunlight. Leaves are the primary food producing part of these plants. · Dormancy is a period of suspended life processes brought on by changes in the environment.	

Grade Four
Science Strand

Living Systems

The strand “Living Systems” begins in second grade and builds from basic to more complex understandings of a system, both at the ecosystem level and at the level of the cell. The concept of five kingdoms of organisms and a general classifying of organisms are also presented. The other major topics developed in the strand include the types of relationships among organisms in a food chain, different types of environments and the organisms they support, and the relationship between organisms and nonliving environment. This strand includes science standards 2.5, 3.5, 3.6, 4.5, 5.5, and 6.9.

Strand: Living Systems

Standard 4.5

The student will investigate and understand how plants and animals in an ecosystem interact with one another and the nonliving environment. Key concepts include

- behavioral and structural adaptations;
- organization of communities;
- flow of energy through food webs;
- habitats and niches;
- life cycles; and
- influence of human activity on ecosystems.

Understanding the Standard

This standard focuses on the relationships among plants, animals, and the non-living environment and brings together several elements of both Life Processes and Living Systems. This standard assumes students have a basic understanding that all living things are interrelated and dependent in some way on other living things and their environment. Plants and animals in ecological systems live in a web of interdependence in which each species contributes to the functioning of the overall system. Organisms live in a habitat to which they are structurally and behaviorally adapted. Certain conditions within environments determine which organisms and communities succeed there. This standard builds upon several previous standards (1.5, 2.4, 2.5. 3.4, 3.5 and 3.6). It is intended that students will actively develop science investigation, reasoning, and logic skills (4.1) in the context of the key concepts presented in this standard.

Standard 4.5

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: · Organisms have structural adaptations, or physical attributes, that help them meet a life need. · Organisms also have behavioral adaptations, or certain types of activities they perform, which help them meet a life need. · The organization of communities is based on the utilization of the energy within a given ecosystem. The greatest amount of energy in a community is in the producers. · Within a community, organisms are dependent on the survival of other organisms. · The organization of a community is defined by the interrelated niches within it. · The sun's energy cycles through ecosystems from producers through consumers and back into the nutrient pool through decomposers. · An organism's habitat provides food, water, shelter, and space. The size of the habitat depends on the organism's needs.	In order to meet this standard, it is expected that students will be able to: · distinguish between structural and behavioral adaptations. · infer the function of basic adaptations and provide evidence for the conclusion. · understand that adaptations allow an organism to succeed in a given environment. · explain how different organisms use their unique adaptations to meet their needs. · create a model of an organism adapted to a unique environment. · describe why certain communities exist in given habitats. · illustrate the food webs in a local area and compare and contrast the niches of several different organisms within the community. · compare and contrast the differing ways an organism interacts with its surroundings at various stages of its life cycle. Specific examples include a frog and a butterfly.

Standard 4.5 (continued)

Overview	Essential Knowledge, Skills, and Processes
· A niche is the function that an organism performs in the food web of that community. A niche also includes everything else the organism does and needs in its environment. No two types of organisms occupy the exact same niche in a community. · During its life cycle, an organism's role in the community, its niche, may change. For example, what an animal eats, what eats it, and other relationships will change. · Humans can have a major impact on ecosystems.	· differentiate among positive and negative influences of human activity on ecosystems.

Grade Four
Science Strand

Interrelationships in Earth/Space Systems

The strand focuses on student understanding of how Earth systems are connected, and how the Earth interacts with other members of the solar system. The topics developed include shadows; relationships between the sun and the Earth; weather types, patterns, and instruments; properties of soil; characteristics of the ocean environment; and organization of the solar system. This strand includes science standards K.7, 1.6, 2.6, 3.7, 4.6, 5.6, and 6.10.

Standard 4.6

The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include

- weather factors (temperature, air pressure, fronts, formation and type of clouds, and storms); and
- meteorological tools (barometer, hygrometer, anemometer, rain gauge, and thermometer).

Understanding the Standard

This standard focuses on weather conditions and a more technical understanding of the tools and methods used to forecast future atmospheric conditions. Weather is introduced in science standard 2.6. It is intended that students will actively develop science investigation, reasoning, and logic skills (4.1) in the context of the key concepts presented in this standard.

Standard 4.6

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: · Temperature is the measure of the amount of heat energy in the atmosphere. · The amount of moisture (humidity) in the atmosphere varies. · Air pressure is due to the weight of the air and is determined by several factors including the temperature of the air. · The boundary between air masses of different temperature and humidity is called a front. · Cirrus, stratus, cumulus, and cumulo-nimbus clouds are associated with certain weather conditions. · Extreme atmospheric conditions create various kinds of storms such as thunderstorms, hurricanes, and tornadoes. · Different atmospheric conditions create different types of precipitation.	In order to meet this standard, it is expected that students will be able to: · use a thermometer to compare air temperatures over a period of time. · compare the humidity at different times of the day. · analyze the changes in air pressure occurring over time using a barometer, and predict what the changes mean in terms of changing weather patterns. · differentiate between the types of weather associated with high and low pressure air masses. Illustrate and label high and low pressure air masses and warm and cold fronts. · differentiate between cloud types (cirrus, stratus, cumulus, and cumulo-nimbus clouds) and associated weather. · compare and contrast the formation of different types of precipitation.

Standard 4.6 (continued)

Overview	Essential Knowledge, Skills, and Processes
· Meteorologists gather data by using a variety of instruments · Meteorologists use data to predict weather patterns. · A barometer measures air pressure. · A hygrometer measures moisture in the air. · An anemometer measure wind speed. · A rain gauge measures precipitation. · A thermometer measures the temperature of the air.	· recognize a variety of storm types, describe the weather conditions associated with each, and when they occur (thunderstorms, hurricanes, and tornadoes). · analyze and report information about temperature and precipitation on weather maps. · measure the amount of moisture in the air using a hygrometer. · measure wind speed using an anemometer. · measure precipitation with a rain gauge. · design an investigation where weather data are gathered using meteorological tools and charted to make weather predictions.

Grade Four
Science Strand

Earth Patterns, Cycles, and Change

The strand focuses on student understanding of patterns in nature, natural cycles, and changes that occur both quickly and over time. An important idea represented in this strand is the relationship among Earth cycles and change and their effects on living things. The topics developed include noting and measuring changes, weather and seasonal changes, the water cycle, cycles in the Earth-moon-sun system, and change in the Earth's surface over time. This strand includes science standards K.8, K.9, 1.7, 2.7, 3.8, 3.9, 4.7, and 5.7.

Standard 4.7

The student will investigate and understand the relationships among the Earth, moon, and sun. Key concepts include

- the motions of the Earth, moon, and sun (revolution and rotation);
- the causes for the Earth's seasons and phases of the moon;
- the relative size, position, and makeup of the Earth, moon, and sun;
- unique properties of the Earth as a planet and as part of the solar system; and
- historical contributions in understanding the Earth-moon-sun system.

Understanding the Standard

This standard focuses on the Earth-moon-sun system and includes knowledge related to the motions of this system and the results of our unique position in it. This includes the presence of an atmosphere, liquid water, and life. The standard is built on concepts developed in science standard K.7, 1.6, and 3.8 and will be further expanded in 6.10. A more in-depth study of the Earth's make-up is in standard 5.7. It is intended that students will actively develop science investigation, reasoning, and logic skills (4.1) in the context of the key concepts presented in this standard.

Standard 4.7

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: · The Earth completes one revolution around the sun every 365 days. The moon revolves around the Earth about once every month. · Due to the moon's revolution around the Earth, a lunar eclipse will occur when it moves into the Earth's shadow. A solar eclipse will occur when the moon moves between the sun and Earth. · Due to its axial tilt, the Earth experiences seasons during its revolution around the sun. · The phases of the moon are caused by its position relative to the Earth and the sun. The phases of the moon include the new, crescent, gibbous, quarter, and full moon. · The sun is an average-sized yellow star, about 110 times the diameter of the Earth. · Our moon is a small rocky satellite, having about one-quarter the diameter of the Earth and one-eighth its mass. It has extremes of temperature, (virtually) no atmosphere and water, and no life.	In order to meet this standard, the student will need to be able to: · differentiate between rotation and revolution. · distinguish between a solar and lunar eclipse and diagram how each occurs. · describe how the Earth's axial tilt causes the seasons. · model the formation of the eight moon phases, sequence the phases in order, and describe how the phases occur. · describe the major characteristics of the sun, including approximate size, color, and overall composition. · create and describe a model of the Earth -moon -sun system with approximate scale distances and sizes. · assess the importance and implications of water to life and Earth processes. · compare and contrast the Earth-centered to the sun-centered model of the solar system.

Standard 4.7 (continued)

Overview	Essential Knowledge, Skills, and Processes
· The Earth is one of nine planets that revolve around the Sun and comprise the solar system. The Earth, third planet from the sun, is one of the four rocky inner planets. It is about 150 million kilometers from the sun. · The Earth is a geologically active planet with a surface that is constantly changing. Unlike the other four inner planets, it has large amounts of life-supporting water and an oxygen-rich atmosphere. The Earth's protective atmosphere blocks out most of the sun's damaging rays. · Our understanding of the solar system has changed from Aristotle's and Ptolemy's Earth-centered view to the sun-centered model of Copernicus and Galileo. · The NASA Apollo missions added a great deal to our understanding of the moon. · Our understanding of the sun, moon, and the solar system continues to change with new scientific discoveries.	· analyze the differences in what Aristotle, Ptolemy, Copernicus, and Galileo observed and what influenced their conclusions. · compare and contrast the surface conditions of the Earth, moon, and sun. · describe a contribution of the NASA Apollo missions to our understanding of the moon.

Grade Four
Science Strand

Resources

The strand focuses on student understanding of the role of resources in the natural world and how people can utilize those resources in a sustainable way. An important idea represented in this strand is the concept of management of resource use. This begins with basic ideas of conservation and proceeds to more abstract consideration of costs and benefits. The topics developed include conservation of materials, soil and plants as resources, energy use, water, Virginia's resources, and how public policy impacts the environment. This strand includes science standards K.10, 1.8, 2.8, 3.10, 3.11, 4.8, and 6.11.

Strand: Resources

Standard 4.8

The student will investigate and understand important Virginia natural resources. Key concepts include

- watershed and water resources;
- animals and plants, both domesticated and wild;
- minerals, rocks, ores, and energy sources; and
- forests, soil, and land.

Understanding the Standard

Virginia has a rich variety of resources. These provide the raw materials for our daily lives and sustain our economy. Natural resources are finite and must be used wisely to insure their continued availability. This concept of natural resources is introduced in 1.8 and extended in 6.11. It is intended that students will actively develop science investigation, reasoning, and logic skills (4.1) in the context of the key concepts presented in this standard.

Standard 4.8

Overview	Essential Knowledge, Skills, and Processes
The concepts developed in this standard include the following: · Virginia is rich in a wide variety of natural resources including forests, arable land, coal, sand and aggregates, wildlife and aquatic organisms, clean water and air, and beautiful scenery. · A watershed is an area over which surface water (and the materials it carries) flows to a single collection place. The Chesapeake Bay watershed covers approximately half of Virginia's land area. Land drained by rivers west of Roanoke is part of the Mississippi watershed. · Virginia's water resources include groundwater, lakes, reservoirs, rivers, bays, and the Atlantic Ocean. · Animal and plant resources in Virginia include a great variety of wild and domesticated populations. · Natural and cultivated forests are a widespread resource in Virginia. · Virginia's soil and land support a great variety of life, provide space for many economic activities, and offer a variety of recreational opportunities.	In order to meet this standard, the student will need to be able to: · compare and contrast natural and man-made resources. · differentiate between wild and domesticated animals and plants and categorize examples of each found in Virginia. · distinguish among rivers, lakes, and bays; describe characteristics of each; and name an example of each in Virginia. · create and interpret a model of a watershed. Evaluate the statement: "We all live downstream." · recognize the importance of Virginia's mineral resources including coal, limestone, granite, and sand and gravel. · appraise the importance of natural and cultivated forests in Virginia. · describe a variety of soil and land uses important in Virginia.